IN THE CLAIMS

1-9. Canceled.

10. (Currently Amended) A method for recording and processing vibratory source seismic data, the method comprising:

(a) generating a cascaded sweep sequence comprising N sweep segments that are either concatenated or overlapping sequentially, where N is equal to or greater than 2, said N sweep segments being substantially identical, except that the initial phase angles of said N sweep segments are progressively rotated by a constant phase increment of about $2\,m\pi/N$ radians where m is an integer and $|m|>1$;

(b) using said cascaded sweep sequence to drive a at least one vibratory source thereby propagating a seismic wave into the earth at a selected location;

(c) recording a ground force signal associated with said seismic wave;

(d) recording at least one reflection signal from a location within the earth responsive to said seismic wave; and

(e) using said recorded ground force signal for processing the signal recorded to produce a processed signal.

11. (Original) The method of claim 10 wherein processing the signal recorded comprises cross-correlating the recorded signal with a signal comprising said ground force signal and a first and a last sweep segment of said ground force signal.

12. (Original) The method of claim 10, wherein said sweep segments further comprise a sinusoidal wavetrain having a frequency that either increases monotonically with time or decreases monotonically with time.

13. (Original) The method of claim 12 wherein said increase or decrease of said frequency is linear with time.

14. (Original) The method of claim 10, wherein said sweep segments further comprise a psuedo-random sweep series.

15-38 Canceled.

39. (New) The method of claim 10 wherein said at least one vibratory source comprises a plurality of vibratory sources, the method further comprising:

i) selecting a number, n, of said vibratory sources activated by n said cascaded sweep sequence signals;

ii) selecting a number of a highest order harmonic that has sufficient strength to cause significant harmonic distortion of a sweep segment that is part of a sweep sequence;

iii) defining a reference signal associated with each of said sources, each reference signal comprising a number N of sweep segments, N being greater than n, said sweep segments being either concatenated or overlapping; and

iv) selecting initial phase angles for each sweep segment of each reference signal so that substantially all harmonics up to and including said highest order harmonic are suppressed and driving each vibratory source with its sweep sequence and driving each of said sources with its associated reference signal.

40. (New) The method of claim 39 wherein selecting said initial phase angles for generating a sweep sequence associated with each energy source further comprises:

(A) constructing a table with N rows and N columns, where N is the number of sweep segments, each entry e_{hj} being calculated from the formula $e_{hj} = h\,j$ modulo N, where h is the row number and j is the column number;

(B) selecting a number of columns equal to the number of sources such that the number in the first row of each selected column does not appear again in any selected column before the row H=F+1, where F is the highest order harmonic determined to cause significant crossfeed; and

(C) assigning a selected column to each seismic energy source, the initial phase angle for the h-th sweep of that seismic energy source being represented by the number in the h-th row of that column multiplied by $2\pi/N$.

41. (New) A method for recording and processing vibratory source seismic data, the method comprising:

(a) simultaneously transmitting, with n vibratory sources where $n \geq 1$, associated ground force signals into the earth, each said ground force signal including a

fundamental signal and harmonics thereof, said fundamental signal having an initial phase;

(b) recording said n ground force signals;

(c) recording at least one reflection signal from a location within the earth responsive to n ground force signals to give a first recorded signal;

(d) repeating steps (a)-(c) m-1 times wherein said initial phases are shifted by $2\pi/m$ radians to give a total of m recorded signals and n×m ground force signals; and

(e) using the n×m ground force signals for processing the m recorded signals to give processed signals associated with said n vibratory sources.

42. (New) The method of claim 41 wherein processing the m recorded signals further comprises:

i) correlating the first recorded signal with each associated ground force signal to give n intermediate signals;

ii) repeating step (i) m-1 times to give a total of n×m intermediate processed signals; and

iii) summing the m intermediate processed signals associated with each vibratory source to give a processed signal associated with each vibratory source.

43. (New) The method of claim 42, wherein said sweep segments further comprise a sinusoidal wave train having a frequency that either increases monotonically with time or decreases monotonically with time.

44. (New) The method of claim 43 wherein said increase or decrease of said frequency is linear with time.

45. (New) The method of claim 41, wherein said sweep segments further comprise a pseudo-random sweep series.

46. (New) The method of claim 45, wherein said pseudo-random sweep series are phase-rotated by selected increments.

47. (New) A method for recording and processing vibratory source seismic data, the method comprising:

(a) selecting a number of seismic energy sources to be used for surveying;

(b) selecting a number of a highest order harmonic that has sufficient strength to cause significant harmonic distortion of a sweep segment that is part of a sweep sequence;

(c) defining a reference signal associated with each of said sources, each reference signal comprising a number N of sweep segments, N being greater than the number of seismic sources, said sweep segments being either concatenated or overlapping;

(d) selecting initial phase angles for each sweep segment of each reference signal so that substantially all harmonics up to and including said highest order harmonic are suppressed and driving each vibratory source with its sweep sequence and

driving each of said sources with its associated reference signal, thereby generating seismic waves propagating into the earth;

(e) recording ground force signals associated with each reference signal;

(f) recording at least one reflection signal from a location within the earth responsive to said seismic waves; and

(g) using said ground force signals for processing said at least one recorded reflection signal.

48. (New) The method of claim 47 wherein processing said at least one recorded signal comprises correlating the at least one recorded signal with a plurality of processing signals, each said processing signal comprising said reference signal combined with at least one additional segment of said reference signal.

49. (New) The method of claim 47 wherein selecting initial phase angles further comprises:

i) constructing a table with N rows and N columns, each entry e_{hm} being calculated from the formula $e_{hm} = h\ m$ modulo (N) where h is the row number and m is the column number;

ii) selecting a number of columns equal to the number of sources such that none of the numbers of each selected column appears again in any other selected column before the row H=F+1; and

iii) assigning a selected column to each seismic energy source, the initial phase angle for the h-th sweep segment of that seismic energy source being represented by the number in the h-th row of that column multiplied by $2\pi/N$.

50. (New) The method of claim 47, wherein said sweep segments further comprise a sinusoidal wavetrain having a frequency that either increases monotonically with time or decreases monotonically with time.

51. (New) The method of claim 50 wherein said increase or decrease of said frequency is linear with time.

52. (New) The method of claim 47, wherein said sweep segments further comprise a pseudo-random sweep series.

53. (New) The method of claim 52, wherein said pseudo-random sweep series are phase-rotated by selected increments.